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Investigation of Critical Phenomena with Precision Density Measurements **in Liquid Helium near the Lambda Transition** WEN JIANG, DONALD STRAYER, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA91109-8099, NAI-CHANG YEH, NILS ASPLUND, 114-36 Condensed Matter Physics, California Institute of Technology, Pasadena, CA91 125[1] -- We demonstrate how precision measurements can improve the resolution of experimentally determined critical exponents and relevant coefficients near phase transitions. Using a high-Q (10^{10}) microwave cavity together with high-resolution (one part in 10*) thermometry (HRT) and high-resolution frequency read-out (to one part in 10^{13}) techniques, we have estimated the precision achievable in the density measurement in helium near the lambda transition (T_λ). With a density resolution of one part in 1010, wc evaluate the resolution in the critical exponent α and the amplitude coefficients of the thermal expansion coefficient β_P near T_λ. We conclude that improvements can be made with our precision density measurements. Furthermore, the accuracy of α and the leading amplitude coefficient can be improved by restricting the data analysis to the critical region determined by the Ginzberg criterion, Preliminary experimental results using a high-Q niobium cavity will be presented.

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[X] Prefer Oral Session
[ ] Prefer Poster Session

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